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STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
THOMPSON, JAMES A	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/834,623	Applicant(s) SUZUKI ET AL.	
	Examiner James A. Thompson	Art Unit 2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12 December 2005 has been entered.

Response to Arguments

2. Applicant's arguments filed 12 December 2005 have been fully considered but they are not persuasive.

Regarding page 8, line 28 to page 9, line 25: Firstly, a cursory reading of the final rejection, dated 27 June 2005 and mailed 11 July 2005, shows that the portions of Wada (US Patent 5,949,922) relied upon to teach calculating center-of-gravity information are figure 12(S5) and column 15, lines 16-20 of Wada [see page 7, lines 24-27 of said final rejection], and not anything in column 12 of Wada, as Applicant has erroneously stated. Furthermore, Examiner has not suggested in any way that Ohsawa teaches calculating the center-of-gravity information [see page 7, lines 8-11 of said final rejection]. Ohsawa teaches that the list of halftone dot data, which is generated by the system of Yamashita (US Patent 5,555,362) [see page 3, lines 14-24 of said final rejection], is calculated in a given area defined by a central pixel and surrounding pixels [see page 5, lines 11-20 of said final rejection]. In other words, the

information in the list taught by Yamashita is halftone dot information comprising geometric center information. This is a very similar, but not precisely the same, information as center-of-gravity information. The teachings of Wada provide a more precise measurement for halftone dot information, namely center-of-gravity information [see page 7, lines 24-27 of said final rejection]. Using the center-of-gravity, as taught by Wada, rather than the geometrical center, as taught by Ohsawa, improves the system since using center-of-gravity information and basing measurements, such as density, on the center-of-gravity reduces the overall noise in the image (column 14, lines 34-42 of Wada), and thus produces a better result [see page 8, lines 10-14 of said final rejection]. In response to Applicant request for clarification [see page 9, lines 11-13 of Applicant's present arguments], clarification has already been given in the relevant portion of said final rejection. Examiner clearly stated "[a]t the time of the invention, it would have been obvious to a person of ordinary skill in the art to calculate said center-of-gravity information, as taught by Wada, and store said information in the halftone dot information list taught by Yamashita, and use said center-of-gravity information taught by Wada instead of simply the center pixel taught by Ohsawa to calculate the halftone dot density in a given area, as taught by Ohsawa" [see page 8, lines 3-10 of said final rejection].

Regarding page 9, lines 26-32: Examiner respectfully directs Applicant to figures 8A-8E and column 12, lines 37-46 of Wada in which tone values are discussed with relation to the system of Wada. There are many other portions of Wada which discuss "tone values". As is well-known in the art, "tone

values" in the context of image scanning and halftoning demonstrates "halftone dot density". Thus, halftone dot density is clearly taught in Wada. Furthermore, in the context of the system taught by Yamashita in view of Ohsawa and Wada, to which Edgar is combined, "tone values" would also clearly correspond to the "halftone dot density" values taught therein.

Regarding page 10, lines 1-12: The separate colors that the images are separated into in the system of Edgar (US Patent 5,266,805) are clearly based on halftone dot density. The image data received in the system of Edgar is separated into pixel data which has three color components (RBG) and an infrared component (figure 1(20-26); figure 4(70-76); and column 8, lines 48-56 of Edgar). Thus, the halftone dot density is calculated for each color separation.

Regarding page 10, lines 13-25: Since Applicant has provided no reference to which particular arguments Applicant is referring, Examiner assumes that Applicant is referring to the arguments presented in the paragraph beginning on page 8 and ending on page 9 of Applicant's arguments dated 14 November 2005. Applicant made no specific arguments therein, but merely stated Applicant's personal summary of Yamashita, Ohsawa, Wada and Edgar in relation to what Applicant believes Yamashita, Ohsawa, Wada and Edgar have been upon in the preceding office action.

Regarding page 10, line 27 to page 11, line 17: All of the elements of claim 4 are recited in claim 3, except for the portion specifically set forth in the rejections regarding claim 4. Since the rejections regarding claim 3 are incorporated by reference, then the totality of claim 4 is demonstrated to be taught by the prior art.

Regarding page 11, line 18 to page 12, line 28: Examiner has fully considered the amendments to claim 5. Furthermore, Applicant's arguments with respect to claim 6 are based on the alleged lack of teaching of a newly added limitation of claim 5. Corresponding prior art rejections based on the present amendments to the claims are given in detail below.

Regarding page 12, line 30 to page 14, line 17: Examiner has not relied upon Ohsawa to teach "optimizing a value of a target pixel to be binarized", as recited in claim 1. Edgar is relied upon to teach optimizing a value of a target pixel to be binarized (column 6, lines 53-58 of Edgar). By subtracting out the undesirable imperfections from the visual spectra (column 6, lines 53-58 of Edgar), the resulting target pixels, which are to be binarized, are optimized since the best values have been obtained [see page 9, lines 11-16 of said final rejection]. Dependent claims 8-15 have also been rejected, as clearly set forth in detail on pages 12-15 of said final rejection, and below.

Regarding page 14, lines 19-30: By changing to the left or right and then a one pixel change in the opposite direction, as taught by Graham (US Patent 5,222,154), the mask is shifted only in a new row or column that is not included in the mask before shifting. In other words, a new column that is not included in the mask before shifting (left or right by one pixel) is used to count the number of black pixels so that the jaggy can be detected.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 3-15 and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita (US Patent 5,555,362) in view of Lee (US Patent 6,160,913), Ohsawa (US Patent 4,876,610), and Wada (US Patent 5,949,922).

Regarding claims 3, 18 and 19: Yamashita discloses an image processing apparatus (figure 1 of Yamashita) comprising an input unit (figure 1(2) of Yamashita) that inputs a binary image as a multi-valued image (column 3, lines 4-6 of Yamashita); a halftone dot image area map creating unit (figure 1(4A) and column 4, lines 36-40 of Yamashita) controlling the image processing apparatus to search for a halftone dot image area in the multi-valued image according to a process comprising recognizing halftone dots in the multi-valued image (column 4, lines 59-64 of Yamashita), and generating a list storing boundary box information (figure 3(30) of Yamashita) as information about each halftone dot in the recognized halftone dot image area (column 4, lines 13-18 and lines 59-64 of Yamashita). The image (figure 3 of Yamashita) is separated into a plurality of boundary boxes, which are stored in memory (column 4, lines 13-18 of Yamashita). The image data type for each bounded region is determined to be either character data or

image data (column 4, lines 59-64 of Yamashita). The image are would necessarily be a halftone dot image area since images are printed as a collection of halftone dots.

Yamashita further discloses searching for a line drawing/ character image area in the multi-valued image (column 4, lines 59-61 of Yamashita); and creating a line drawing/character image area map (column 4, lines 13-18 of Yamashita).

Yamashita further discloses a halftone dot image binarizing unit (figure 1(12) of Yamashita) that binarizes an input image corresponding to the halftone dot image area map and generates a binarized halftone dot image (column 3, lines 25-31 of Yamashita). In order to output the image data corresponding to the halftone dot image area map to a display screen or a printer (column 3, lines 25-31 of Yamashita), binarizing said input image and generating a binarized halftone dot image is inherent. Otherwise, the image data would not be in a form that could be output to the display screen or the printer.

Yamashita further discloses an image combining unit (figure 1(10) of Yamashita) that combines the binarized halftone dot image and the binarized line drawing/character image (figure 6 (60); column 4, lines 5-7; and column 10, lines 11-14 of Yamashita). The image combining unit (layout model storage unit) (figure 1(10) of Yamashita) stores the overall layout model (figure 6(60); column 4, lines 5-7; and column 10, lines 11-14 of Yamashita) that is displayed (column 4, lines 7-8 of Yamashita) and thus combines the binarized halftone dot image and the binarized line drawing/character image.

Yamashita does not disclose expressly that said list is a list of halftone dot information comprising center-of-gravity information about centers of gravity of halftone dots as

information about each recognized halftone dot; eliminating an erroneously recognized halftone dot according to a process comprising calculating a halftone dot density in a given area by referring to the center-of-gravity information in the list of halftone dot information, deleting corresponding halftone dot information from the halftone dot information list when the halftone dot density does not meet a given condition, and creating a halftone dot image area map according to the halftone dot information list from which the erroneously recognized halftone dot has been eliminated; a line drawing/character image area map creating unit that searches for a line drawing/ character image area in the multi-valued image and creates a line drawing/character image area map; that said halftone dot image binarizing unit suppresses input read errors that occur when said input unit inputs the binary image by optimizing a value of a target pixel to be binarized; and a line drawing/ character smoothing unit that smoothes a jaggy contained in an input image corresponding to the line drawing/character area map, and generates a binarized line drawing/character image.

Lee discloses recognizing halftone dots in the multi-valued image (figure 4(402) and column 7, lines 12-18 of Lee), generating a list of halftone dot information (figure 4(404) of Lee) comprising center information about centers of halftone dots (column 7, lines 30-35 of Lee), as information about each recognized halftone dot (figure 4(402) and column 7, lines 12-18 of Lee), and eliminating an erroneously recognized halftone dot (figure 4(406); column 7, lines 18-22; and column 8, lines 1-7 of Lee) according to a process, comprising calculating a halftone dot density in a given area (column 7, lines 51-55 of Lee) by referring to the center information in the list of

halftone dot information (column 7, lines 36-41 of Lee), deleting corresponding halftone dot information from the halftone dot information list when the halftone dot density does not meet a given condition (column 7, lines 43-48 and lines 51-56 of Lee), and creating a halftone dot image area map (figure 4 ("HALFTONE REGION MAP") of Lee) according to the halftone dot information list from which the erroneously recognized halftone dot has been eliminated (column 8, lines 1-12 of Lee). The process of halftone region classification performed with a 5x5 local map is repeated with a 7x7 local map for the purpose of reclassifying pixels (column 8, lines 1-7 of Lee) to determine if a pixel classified as a halftone pixel was erroneously classified as a halftone pixel (column 7, lines 18-22 of Lee).

Lee further discloses a line drawing/character area map creating unit (figure 12(4) of Lee) that searches for a line drawing/character image area in the multi-valued image (column 7, lines 65-67 and column 8, lines 37-41 of Lee) and creates a line drawing/character image area map (column 8, line 58 to column 9, line 2 of Lee). If a pixel is not a halftone pixel, then the pixel is a binary pixel. In other words, if a pixel is not a halftone pixel, then the pixel is in a region of pixels that are either black or white, which would be an image area corresponding to line drawings and characters (column 2, lines 27-34 of Lee). Line drawings and characters are not considered halftone image regions, but are considered binary image regions. The mask used to specifically output the non-halftone dot pixels constitutes a line drawing/character area map.

Lee further discloses suppressing input read error occurred when said input unit inputs the binary image by optimizing a

value of a target pixel to be binarized (column 4, line 63 to column 5, line 1 of Lee).

Yamashita and Lee are combinable because they are from the same field of endeavor, namely the detection of digital document image data regions and properties and processing said digital document image data based on said properties. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to separate the halftone dot regions and the line drawing/character regions, while suppressing input read error and further ensuring that initially detected halftone dot regions have not been erroneously detected, as taught by Lee. The motivation for doing so would have been that removing halftone dot regions from a line drawing/character region avoids printing artifacts that occur when line drawing/character regions (which are binary dot regions) are printed as halftone dot image regions. Furthermore, removing halftone dot regions from line drawing/character regions improves the compression of the resultant image (column 1, lines 56-62 of Lee). Therefore, it would have been obvious to combine Lee with Yamashita.

Yamashita in view of Lee does not disclose expressly that said list is a list of halftone dot information comprising center-of-gravity information about centers of gravity of halftone dots as information about each recognized halftone dot; and a line drawing/character smoothing unit that smoothes a jaggy contained in an input image corresponding to the line drawing/character area map, and generates a binarized line drawing/character image.

Ohsawa discloses that the average halftone dot density is calculated in a given area defined by a central pixel and surrounding pixels (column 4, lines 39-42 of Ohsawa). If the

absolute difference between said average halftone dot density and said central pixel is larger than a pre-defined threshold, then said area is determined to be a line drawing/character area and is thus deleted from the set of halftone dot image areas and incorporated into the mapping of the line drawing/character image area map (figures 5a and 5b and column 4, lines 42-45 and lines 60-66 of Ohsawa).

Ohsawa further discloses a line drawing/character smoothing unit (figure 1(15) and column 3, lines 28-31 of Ohsawa) that smoothes a jaggy contained in an input image corresponding to the line drawing/character area map, and generates a binarized line drawing/character image (column 5, lines 11-18 of Ohsawa). The purpose of using smaller matrices is to reduce the area of the error dispersion, thereby reproducing characters and lines in a precise manner (column 5, lines 14-18 of Ohsawa). The natural result of this would be to remove jaggy and other artifacts from lines and characters.

Yamashita in view of Lee is combinable with Ohsawa because they are from the same field of endeavor, namely digital image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to delete halftone dot information from the set of halftone dot image areas if a given condition, namely the threshold for the difference between the absolute difference between said average halftone dot density and said central pixel, is met, as taught by Ohsawa, said set of halftone dot image areas being represented by the halftone dot image area map and halftone dot information list taught by Yamashita. The motivation for doing so would have been that if a halftone image data area does not satisfy said given condition taught by Ohsawa, it is not

reasonable to include said halftone dot image data area as part of the halftone dot image data set, but instead as part of the line drawing/character image data set (column 4, lines 49-54 of Ohsawa). Further, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the line drawing/character smoothing unit taught by Ohsawa to reduce the jaggy in lines and characters. The motivation for doing so would have been more precisely reproduce characters and lines (column 5, lines 17-18 of Ohsawa). Therefore, it would have been obvious to combine Ohsawa with Yamashita.

Yamashita in view of Ohsawa does not disclose expressly that said list is a list of halftone dot information comprising center-of-gravity information about centers of gravity of halftone dots as information about each recognized halftone dot.

Wada discloses calculating center-of-gravity information about centers of gravity of halftone dots as information about each halftone dot in the area of an image (figure 12(S5) and column 15, lines 16-20 of Wada).

Yamashita in view of Lee and Ohsawa is combinable with Wada because they are from the same field of endeavor, namely digital image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to calculate said center-of-gravity information, as taught by Wada, and store said information in the halftone dot information list taught by Yamashita, and use said center-of-gravity information taught by Wada instead of simply the center pixel taught by Ohsawa to calculate the halftone dot density in a given area, as taught by Ohsawa. The motivation for doing so would have been using the center-of-gravity information and basing measurements, such as density, on the center-of-gravity reduces the overall

noise in the image (column 14, lines 34-42 of Wada), and thus produces a better result. Therefore, it would have been obvious to combine Wada with Yamashita in view of Lee and Ohsawa to obtain the invention as specified in claims 3, 18 and 19.

Further regarding claim 18: The apparatus of claim 3 performs the method of claim 18.

Further regarding claim 19: The apparatus of claim 3 can be performed by executing a program stored in a computer (column 10, lines 27-32 of Yamashita).

Regarding claim 4: Yamashita discloses that a given area is delineated by boundary blocks (figure 3 and column 4, lines 54-58 of Yamashita).

Yamashita does not disclose expressly that said halftone dot image area map creating unit calculates a halftone dot density in one of blocks that correspond to a given area by referring to the center-of-gravity information about halftone dots in said one of the blocks and deletes corresponding information from the halftone dot image area map when the halftone dot density does not meet a given condition.

Lee discloses calculating a halftone dot density in a given area (which would correspond to one of the blocks taught by Yamashita) (column 7, lines 51-55 of Lee) by referring to the center information in the list of halftone dot information (column 7, lines 36-41 of Lee) and deleting corresponding information from the halftone dot information image area map when the halftone dot density does not meet a given condition (column 7, lines 43-48 and lines 51-56 of Lee).

Yamashita and Lee are combinable because they are from the same field of endeavor, namely the detection of digital document image data regions and properties and processing said digital

document image data based on said properties. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to delete information from the halftone dot information image area map under a certain given condition for the halftone dot density, as taught by Lee. The motivation for doing so would have been doing so would separate the halftone dot image area from the line drawing/character (binary dot) image area, which has the advantage of avoiding printing artifacts that occur when line drawing/character regions (which are binary dot regions) are printed as halftone dot image regions and improving the compression of the resultant image (column 1, lines 56-62 of Lee). Therefore, it would have been obvious to combine Lee with Yamashita.

Yamashita in view of Lee and Ohsawa does not disclose expressly referring to the center-of-gravity information rather than the center information (as taught by Lee).

Wada discloses calculating center-of-gravity information about centers of gravity of halftone dots as information about each halftone dot in the area of an image (figure 12(S5) and column 15, lines 16-20 of Wada).

Yamashita in view of Lee and Ohsawa is combinable with Wada because they are from the same field of endeavor, namely digital image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to calculate said center-of-gravity information, as taught by Wada, and store said information in the halftone dot information list taught by Yamashita, and use said center-of-gravity information taught by Wada instead of simply the center pixel taught by Ohsawa to calculate the halftone dot density in a given area, as taught by Ohsawa. The motivation for doing so would have been

using the center-of-gravity information and basing measurements, such as density, on the center-of-gravity reduces the overall noise in the image (column 14, lines 34-42 of Wada), and thus produces a better result. Therefore, it would have been obvious to combine Wada with Yamashita in view of Lee and Ohsawa to obtain the invention as specified in claim 4.

Regarding claim 5: Yamashita discloses generating a list further comprising boundary box information (figure 3(30) of Yamashita), as information about each halftone dot in the recognized halftone dot image area (column 4, lines 13-18 and lines 59-64 of Yamashita). The image (figure 3 of Yamashita) is separated into a plurality of boundary boxes, which are stored in memory (column 4, lines 13-18 of Yamashita). The image data type for each bounded region is determined to be either character data or image data (column 4, lines 59-64 of Yamashita). The image are would necessarily be a halftone dot image area since images are printed as a collection of halftone dots.

Yamashita further discloses that said creating the halftone dot image area map by the halftone dot image area map creating unit comprises performing a first process of painting out a boundary box (black lines)(column 3, lines 42-48 of Yamashita) and a second process of painting out a portion expanding from the boundary box (white pixel regions) on the basis of the boundary box information to create the halftone dot image area map (column 3, lines 42-48 of Yamashita), and includes the boundary box and the portion that have been painted out in the binarized halftone dot image (column 3, lines 54-59 of Yamashita).

Yamashita in view of Lee and Ohsawa does not disclose expressly that said second process is performed for each of all the center-of-gravity information.

Wada discloses that areas are set to measure the center-of-gravity information (column 15, lines 20-30 of Wada).

Yamashita in view of Lee and Ohsawa is combinable with Wada because they are from the same field of endeavor, namely digital image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to set areas to calculate center-of-gravity information, as taught by Wada, and store said information in the halftone dot information list taught by Yamashita. Thus, the second process taught by Yamashita is performed for each of all the center-of-gravity information taught by Wada. The motivation for doing so would have been using the center-of-gravity information and basing measurements, such as density, on the center-of-gravity reduces the overall noise in the image (column 14, lines 34-42 of Wada), and thus produces a better result. Therefore, it would have been obvious to combine Wada with Yamashita in view of Lee and Ohsawa to obtain the invention as specified in claim 5.

Regarding claim 6: Yamashita in view of Lee does not disclose expressly that, when a gap pixel remains after the first and second processes are performed for each of all said center-of-gravity information, said halftone dot image area map creating unit paints out the gap pixel when a number of gap pixel is smaller than a predetermined threshold value.

Ohsawa discloses that varying sizes of matrices are used to define the boundary boxes (column 5, lines 5-10 of Ohsawa). Ohsawa processes the image data in succession (column 3, lines 54-62 of Ohsawa), so there is an inherent overlap between

boundary boxes in the image area map. Therefore, any potential gaps between a set of boundary boxes are effectively painted over by said overlap.

Yamashita in view of Lee is combinable with Ohsawa because they are from the same field of endeavor, namely digital image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to paint over gap pixels, as taught by Ohsawa, after performing said first and second processes taught by Yamashita. The motivation for doing so would have been to provide appropriate processing for different image data types (column 5, lines 5-10 of Ohsawa). Therefore, it would have been obvious to combine Ohsawa with Yamashita in view of Lee to obtain the invention as specified in claim 6.

Further regarding claim 7: Ohsawa discloses that said line drawing/character (figure 1(13) of Ohsawa) detects a closed area from the multi-valued image in order to create the line drawing/ character area map (column 4, lines 15-19 and lines 54-59 of Ohsawa), said closed area corresponding to the line drawing/ character area (column 4, lines 60-63 of Ohsawa).

Regarding claim 8: Yamashita in view of Lee does not disclose expressly that said halftone dot image binarizing unit sets a proximity area close to a target pixel that is included in the input image corresponding to the halftone dot image area map and is to be binarized.

Ohsawa discloses setting a proximity area close to a target pixel that is included in the input image corresponding to the halftone dot image area map and is to be binarized (column 4, lines 35-39 and column 5, lines 19-20 of Ohsawa). Ohsawa teaches a target (center) pixel (column 4, lines 37-39 of

Ohsawa) which has a proximity area set around and close to it (column 4, line 37 and column 5, lines 19-20 of Ohsawa). Said area is included in the input image corresponding to the halftone dot image area map (column 4, lines 64-66 of Ohsawa). Said area and said halftone dot image are to be binarized (column 3, lines 25-31 of Ohsawa).

Yamashita in view of Lee is combinable with Ohsawa because they are from the same field of endeavor, namely digital image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to set a proximity area for binarization, as taught by Ohsawa, using said halftone dot image binarizing unit taught by Yamashita. The motivation for doing so would have been to provide appropriate processing for different image data types (column 5, lines 5-10 of Ohsawa). Therefore, it would have been obvious to combine Ohsawa with Yamashita in view of Lee to obtain the invention as specified in claim 8.

Further regarding claim 9: Ohsawa discloses a binary digitizing process that disperses the image data error throughout the block under consideration, utilizing weighting and normalization coefficients (column 7, lines 21-45 of Ohsawa). This dispersion helps to correct the signal values. The corrected signal values are then compared with a threshold value (column 7, lines 46-50 of Ohsawa). The corrected signal is dependent upon the distribution of pixel values throughout the block and the size of the block itself (figures 7a and 7b of Ohsawa). Adaptively altering the pixel values based on the pixel value distribution in the halftone dot image area and then comparing that with a threshold value is the same effect as adaptively altering the threshold value in a similar manner, but

leaving the pixel values static. The results are then binarized and output to a printer (column 7, lines 46-50 of Ohsawa). The process of adaptively determining a threshold can be performed using the halftone dot image binarizing unit taught by Yamashita in view of Lee, as combined in the arguments regarding claim 8, upon which claim 9 is dependent.

Further regarding claim 10: Ohsawa discloses that said halftone dot image binarizing unit changes a value of the target pixel (column 7, lines 23-35 of Ohsawa) on the basis of the distribution (figure 7a-7b and column 7, lines 39-45 of Ohsawa), a changed value of the target pixel being used for binarization (column 7, lines 46-50 of Ohsawa). The process of value changing can be performed using the halftone dot image binarizing unit taught by Yamashita in view of Lee, as combined in the arguments regarding claim 8, upon which claim 10 is dependent.

Further regarding claim 11: Ohsawa discloses that when said halftone dot image binarizing unit detects an inclination in regard of pixel values on the basis of distribution thereof (column 4, lines 55-66 of Ohsawa), the halftone dot image binarizing unit does not binarize the target pixel in the absence of change of the value thereof. Ohsawa performs binary digitization by altering the pixel value based on an error dispersion calculation (column 5, lines 5-10 and column 7, line 30 of Ohsawa). If there is no change in the value, additional binarization is not required. Any binarization performed by Ohsawa under these conditions is redundant.

Further regarding claim 12: Ohsawa discloses that said halftone image binarizing unit determines whether the value of the target pixel should be increased or decreased on the basis of the distribution. Ohsawa uses weighting functions that vary

with location and depend upon the matrix distribution (figures 6, 7a and 7b and column 7, lines 21-32 of Ohsawa).

Further regarding claim 13: Ohsawa discloses that said halftone dot image binarizing unit calculates the changed value of the target pixel from a maximum pixel value available in the halftone dot image area when it is determined that the value of the target pixel should be increased, and calculates the changed value of the target pixel from a minimum pixel value available in the halftone dot image area when it is determined that the value of the target pixel should be decreased (column 4, lines 55-59 and column 7, lines 21-35 and lines 46-50 of Ohsawa). The target (center) pixel value of an image block is either increased or decreased based on the error dispersion calculation, along with the other pixels in said image block (column 7, lines 21-35 of Ohsawa). Ohsawa determines the minimum and maximum values of said image block and compares the difference between the maximum and minimum values in said image block with a threshold value (column 4, lines 55-59 of Ohsawa). The center pixel value is then binarized to either 0 or 255 - for eight bit image data - based on said comparison with said threshold value (column 7, lines 46-50 of Ohsawa).

Further regarding claim 14: Ohsawa discloses that said halftone dot image binarizing unit obtains a difference between the value of the target pixel and the changed value thereof, and restrains the changed value when the changed value is larger than a given threshold value (column 7, line 30 and lines 49-50 of Ohsawa). Ohsawa calculates the normalized signal error, which is the difference between the original signal value and the corrected signal value (column 7, line 30 of Ohsawa). The value of the corrected signal is restrained since it cannot be

greater than the maximum possible pixel value (column 7, lines 49-50 of Ohsawa). The maximum pixel value thus acts as a threshold for the signal values.

Further regarding claim 15: Ohsawa discloses that said halftone dot binarizing unit binarizes original values of target pixels that are not changed and changed values of other target pixels by using a threshold value for binarization (column 7, line 30 and lines 46-50 of Ohsawa). Whether the values of the target pixels have been altered or not, Ohsawa binarizes said target pixels based on a threshold value (column 7, lines 46-50 of Ohsawa). If the error values are zero, then the equation given in column 7, line 30 of Ohsawa will have no effect on said original value. If said error values are non-zero, then said equation will have an effect. Either way, said target pixel value is binarized based on said threshold value.

5. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita (US Patent 5,555,362) in view of Lee (US Patent 6,160,913), Ohsawa (US Patent 4,876,610), Wada (US Patent 5,949,922), and Graham (US Patent 5,222,154).

Regarding claim 16: Yamashita in view of Lee, Ohsawa and Wada does not disclose expressly that said line drawing/ character smoothing unit counts a number of black pixels in each row or column in a given area of the input image corresponding to the line drawing/character area map, and detects the jaggy contained in the input image on the basis of ratios of black pixels between rows and columns.

Graham discloses a method that counts a number of black pixels in each row or column in a given area of the input image corresponding to the line drawing/character area map, and

detecting the jaggy contained in the input image on the basis of ratios of black pixels between rows and columns. Graham teaches looking for changes along the vertical and horizontal directions in order to detect a jaggy (column 11, line 65 to column 12, line 2 of Graham). If a black pixel or a comparatively small number of black pixels are surrounded by white pixels, then the black pixel is considered a jaggy (figures 13 and 16 of Graham). Said black pixel(s) are then removed (figure 13 (1302) of Graham). Also, if a white pixel or a comparatively small number of white pixels are surrounded by black pixels, then said white pixel(s) are painted out.

Yamashita in view of Lee, Ohsawa and Wada is combinable with Graham because they are from the same field of endeavor, namely digital image data processing and artifact suppression. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use ratios of black pixels between rows and columns for the purpose of detecting jaggy. The suggestion for doing so would have been to use an alternate jaggy detection and elimination method, as taught by Graham. Therefore, it would have been obvious to combine Graham with Yamashita in view of Lee, Ohsawa and Wada to obtain the invention as specified in claim 16.

Regarding claim 17: Yamashita in view of Lee, Ohsawa and Wada does not disclose expressly setting a mask in the given area to count the number of black pixels in each row or column in said mask, and shifts the mask to count the number of black pixels only in a new row or column that is not included in the mask before shifting, so that the jaggy can be detected by the number of black pixels before and after the mask is shifted.

Graham discloses setting a mask in the given area to count the number of black pixels in each row or column in said mask (figure 13 and column 11, line 65 to column 12, line 3 of Graham), and shifts the mask to count the number of black pixels only in a new row or column that is not included in the mask before shifting (column 11, line 65 to column 12, line 3 of Graham), so that the jaggy can be detected by the number of black pixels before and after the mask is shifted (column 12, lines 26-29 of Graham). Graham teaches a shifting area of consideration, which is the same as a mask, for the sake of determining a jaggy (column 12, lines 7-18 of Graham).

Yamashita in view of Lee, Ohsawa and Wada is combinable with Graham because they are from the same field of endeavor, namely image data processing and artifact suppression. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a shifting area of consideration and the counting of the number of black pixels in a new row or column for jaggy detection and processing, as taught by Graham. The suggestion for doing so would have been the fact that the area needed to detect jaggy changes as the pixels under consideration change (column 11, line 66 to column 12, line 3 of Graham). Therefore, it would have been obvious to combine Graham with Yamashita in view of Lee, Ohsawa and Wada to obtain the invention as specified in claim 17.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Division 2625

24 February 2006

DAVID MOORE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600